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Published in:

Proceedings of the 15th International Software Product Lines Conference (SPLC'11), Munich, Germany

Publication date:

2011

Document Version

Early version, also known as pre-print

[Link to publication](#)

Citation for pulished version (HARVARD):

Abbasi, EK, Hubaux, A & Heymans, P 2011, An Interactive Multi-perspective Toolset for Non-linear Product Configuration Processes (tool demo). in I Schaefer, I John & K Schmid (eds), Proceedings of the 15th International Software Product Lines Conference (SPLC'11), Munich, Germany. vol. 2, ACM Press, pp. 50-50.

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An Interactive Multi-perspective Toolset for Non-linear Product Configuration Processes

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1. BACKGROUND

In software product line engineering (SPLE), *feature diagrams* (FDs) capture commonality and variability in terms of *features* and their relationships. The interactive process during which features are selected and excluded is called *feature-based configuration*. The resulting set of selected features is a high-level specification of the desired product. To facilitate the configuration of large and complex FDs, tools relying on efficient solvers (e.g. SAT, BDD and CSP) were developed.

During our collaboration with industry, we have observed that current tools lack extended support to (1) define multiple perspectives on an FD, and (2) define and control non-linear configuration processes. To address the first challenge, we have revisited the concept of *view* on an FD [2]. A view defines a projection on an FD that contains a limited set of features meaningful to some stakeholders. To address the second challenge, we have used a *workflow* to explicitly specify the configuration process, and to drive the configuration of these views [1]. In a nutshell, each view on the FD is assigned to a task in the workflow. A view is configured when the corresponding task is executed. This combined formalism is called *feature configuration workflow* (FCW) [1]. Both multi-view feature modelling and FCWs have been integrated in a toolset that builds upon mainstream workflow and FD modelling tools.

2. INTEGRATED TOOLSET

Our open source toolset extends and integrates two third-party tools: SPLOT¹ and YAWL². Natively, SPLOT is a system for managing and configuring FDs. We extended it to support multi-view FD modelling and configuration, and view-to-workflow mapping. Workflow design, execution, analysis, and user management is provided by YAWL. Interactive services were added to YAWL so as to trigger view-based configuration in SPLOT. To minimize the coupling be-

¹<http://www.splot-research.org/>

²<http://www.yawlfoundation.org/>

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SPLC'11, August 21-26, 2011, Munich, Germany, Copyright 2011 ACM 978-1-4503-0789-5/11/08 ...\$10.00.

tween YAWL and SPLOT, we implemented from scratch an *FCW Engine* that manages configuration sessions, conveys the information between YAWL and SPLOT, and monitors the configuration process. By encapsulating the communication APIs between the workflow and FD configuration engines, the FCW Engine opens doors for future integrations of alternative third-party components.

The latest stable release of the toolset provides essential operations for multi-view and non-linear configuration environments. Advanced analyses such as guaranteed completion and decision synchronization are currently being implemented and evaluated. The latest version of the toolset, examples, detailed installation instructions, and an introductory video can be found at <http://www.splot-research.org/extensions/fundp/fundp.html>.

3. DEMONSTRATION SUMMARY

In this demo, we consider a configuration scenario inspired from an industrial SPL of communication libraries used in the aerospace industry [1]. We show how (1) stakeholders with different profiles (knowledge, role, preferences...) are handled, (2) views on the FD are tailored to these profiles, and (3) the workflow pilots the configuration of these heterogeneous views. We also explain how the toolset ensures that only legal configuration operations are performed, and eventually supplies a valid product. Finally, we present the toolset's ability to manage concurrent configurations under a shared configuration space assumption. The conflict avoidance and decision notification mechanisms that preserve the global consistency of a configuration are illustrated on the running example.

4. ACKNOWLEDGEMENTS

This work is sponsored by the University of Namur (FSR programme) and the Interuniversity Attraction Poles Programme of the Belgian State, Belgian Science Policy, under the MoVES project.

5. REFERENCES

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